GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR
(GIET UNIVERSITY)
Ph.D. (Second Semester-Summer) Examinations, May – 2025
23SPPEME2013 – Welding Application Technology
(Mechanical Engineering)

Time: 3 hrs   Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer *ANY FIVE* Questions.   **(14 x 5 = 70 Marks)   Marks**

1.a.	How do tool design and process parameters affect joint quality in FSW?	8
b.	Discuss safety measures and the role of automation in enhancing FSW operations.	6
2.	Discuss the microstructural changes in the weld zone, HAZ, and base metal during welding for different materials such as titanium alloys and composites.	14
3.a.	How is finite element modelling used to simulate welding processes, including heat transfer, material behaviour, and residual stress prediction?	7
b.	How do these sensors contribute to detecting weld defects and ensuring process stability?	7
4.	Describe the microstructural zones in FSW (nugget zone, TMAZ, HAZ) and their impact on the mechanical properties of welded materials like aluminium and steel.	14
5.a.	How does joint design influence stress distribution and structural performance in welded structures, and what factors guide the selection of joint configurations?	7
b.	Discuss methods for analysing residual stresses and distortion in welded structures.	7
6.a.	How do these sensors contribute to detecting weld defects and ensuring process stability?	7
b.	How are advanced techniques, such as infrared imaging and acoustic emission monitoring, applied to improve weld quality and productivity?	7
7.	Differentiate SMAW, GMAW, and GTAW based on electrode type, shielding gas, and weld quality	14
8.a.	Compare LBW and EBW in terms of heat input, precision, material compatibility, and industrial applications.	7
b.	What factors influence the selection and optimization of FCAW, GMAW, and SAW for different materials and applications?	7

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